

modulation) inverters, square-wave inverters (voltage inverters and current inverters), and resonance inverters.

The battery 194 in the above embodiments may include Pb cells, NiMH cells, Li cells, or the like cells. A capacitor may be used in place of the battery 194.

Although the power output apparatus is mounted on the vehicle in all the above embodiments, it may be mounted on other transportation means like ships and airplanes as well as a variety of industrial machines.

It should be clearly understood that the above embodiments are only illustrative and not restrictive in any sense. The scope and spirit of the present invention are limited only by the terms of the appended claims.

What is claimed is:

1. A power output apparatus for outputting power to a drive shaft, said power output apparatus comprising:

an engine having an output shaft;

a motor having a rotating shaft and inputting and outputting power to and from said rotating shaft;

three shaft-type power input/output means having three shafts respectively linking said engine and said drive shaft, said three shaft-type power input/output means inputting and outputting power to and from a residual one shaft, based on predetermined powers input to and output from any two shafts among said three shafts;

storage battery means for supplying and receiving an electrical energy required for inputting and outputting power to and from said motor; and

braking control means for controlling said engine and said motor, based on a charging state of said storage battery means, in order to enable a braking force to be applied to said drive shaft.

2. A power output apparatus in accordance with claim 1, wherein said braking control means comprises means for enabling said motor to carry out a regenerative operation, thereby applying a braking force to said drive shaft.

3. A power output apparatus in accordance with claim 1, wherein said braking control means comprises means for enabling said motor to carry out a power operation, thereby applying a braking force to said drive shaft.

4. A power output apparatus in accordance with claim 1, wherein said braking control means comprises means for controlling said motor, in order to enable said motor to motor said engine.

5. A power output apparatus in accordance with claim 1, wherein said braking control means comprises means for locking up said motor.

6. A power output apparatus in accordance with claim 1, said power output apparatus further comprising:

a second motor for inputting and outputting power to and from said drive shaft, in addition to said motor working as a first motor,

wherein said storage battery means comprises means for supplying and receiving an electrical energy required for inputting and outputting power to and from said second motor,

said braking control means comprising means for controlling said engine, said first motor, and said second motor, in order to enable a braking force to be applied to said drive shaft.

7. A power output apparatus in accordance with claim 6, said power output apparatus further comprising:

charging state detection means for detecting the charging state of said storage battery means,

wherein said braking control means comprises means for controlling said engine, said first motor, and said sec-

ond motor based on the charging state of said storage battery means detected by said charging state detection means, thereby applying a braking force to said drive shaft.

8. A power output apparatus in accordance with claim 7, wherein said braking control means comprises means for regulating the charging state of said storage battery means detected by said charging state detection means to be within a predetermined range.

9. A power output apparatus in accordance with claim 6, wherein said braking control means comprises means for controlling said second motor in order to enable said second motor to apply a braking force to said drive shaft, while controlling said first motor in order to make power input to and output from said first motor equal to zero.

10. A power output apparatus in accordance with claim 6, wherein said braking control means comprises means for controlling said second motor in order to enable said second motor to apply a braking force to said drive shaft, while controlling said engine and said first motor in order to set a driving state of said engine to a predetermined operating condition.

11. A power output apparatus in accordance with claim 10, said power output apparatus further comprising:

driving state detection means for detecting a driving state of said drive shaft; and

braking-time driving state setting means for setting the redetermined operating condition based on the driving state of said drive shaft detected by said driving state detection means.

12. A power output apparatus in accordance with claim 10, wherein the driving state of said engine represents a revolving speed of said output shaft of said engine.

13. A power output apparatus in accordance with claim 6, wherein said braking control means comprises means for controlling said first motor, in order to enable said first motor to motor said engine.

14. A power output apparatus in accordance with claim 6, wherein said braking control means comprises means for controlling said first motor and said second motor, in order to enable an electrical energy regenerated by said second motor to be identical with an electrical energy consumed by said first motor.

15. A power output apparatus in accordance with claim 1, said power output apparatus further comprising:

a second motor for inputting and outputting power to and from said output shaft of said engine, in addition to said motor working as a first motor,

wherein said storage battery means comprises means for supplying and receiving an electrical energy required for inputting and outputting power to and from said second motor,

said braking control means comprising means for controlling said engine, said first motor, and said second motor, in order to enable a braking force to be applied to said drive shaft.

16. A power output apparatus in accordance with claim 15, said power output apparatus further comprising:

charging state detection means for detecting the charging state of said storage battery means,

wherein said braking control means comprises means for controlling said engine, said first motor, and said second motor based on the charging state of said storage battery means detected by said charging state detection means.

17. A power output apparatus in accordance with claim 16, wherein said braking control means comprises means for

090055676 062101

35

regulating the charging state of said storage battery means detected by said charging state detection means to be within a predetermined range.

18. A power output apparatus in accordance with claim 15, wherein said braking control means comprises means for controlling said first motor in order to enable said first motor to motor said engine, while controlling said second motor in order to enable said second motor to apply a braking force to said output shaft of said engine.

19. A power output apparatus in accordance with claim 15, wherein said braking control means comprises means for controlling said first motor and said second motor, in order to enable an electrical energy regenerated by said second motor to be identical with an electrical energy consumed by said first motor.

20. A method of controlling a power output apparatus for outputting power to a drive shaft, said method comprising the steps of:

(a) providing (1) an engine having an output shaft; (2) a first motor having a rotating shaft and inputting and outputting power to and from said rotating shaft; (3) a second motor for inputting and outputting power to and from said drive shaft; and (4) three shaft-type power input/output means having three shafts respectively linking said engine and said drive shaft, said three shaft-type power input/output means inputting and outputting power to and from a residual one shaft, based on predetermined powers input to and output from any two shafts among said three shafts;

(b) controlling said second motor, in order to enable said second motor to apply a braking force to said drive shaft; and

36

(c) controlling said engine and said first motor, in order to set a driving state of said engine to a predetermined operating condition.

21. A method of controlling a power output apparatus for outputting power to a drive shaft, said method comprising the steps of:

(a) providing (1) an engine having an output shaft; (2) a first motor having a rotating shaft and inputting and outputting power to and from said rotating shaft; (3) a second motor for inputting and outputting power to and from said drive shaft; (4) three shaft-type power input/output means having three shafts respectively linking said engine and said drive shaft, said three shaft-type power input/output means inputting and outputting power to and from a residual one shaft, based on predetermined powers input to and output from any two shafts among said three shafts; and (5) storage battery means for supplying and receiving an electrical energy required for inputting and outputting power to and from said first motor, and supplying and receiving an electrical energy required for inputting and outputting power to and from said second motor; and

(b) controlling said engine, said first motor, and said second motor, in order to apply a braking force to said drive shaft while keeping a charging state of said storage battery means within a predetermined range.

* * * * *

09885575.062101